SUB C2

WHAT IS CLAIMED IS:

1. A rotor for a synchronous machine comprising
a cylindrical magnetic solid rotor core;
a race-track super-conducting coil winding extending around the rotor core;
a coil support extending through the core and attaching to opposite long sides of the coil winding, and
a pair of end shafts extending axially from said core and attached to the core.

2. A rotor as in claim 1 wherein the rotor core includes a pair of flat surfaces formed on opposite long sides of the rotor core, and said long sides of the coil winding are adjacent the flat surfaces.

3. A rotor as in claim 2 wherein the rotor core includes conduits extending between the flat surfaces, and further comprising a coil support system extending through the conduits to support the coil winding.

4. A rotor as in claim 1 wherein the coil support system and coil are at cryogenic temperatures, and the coil support system is thermally isolated from the rotor core.

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5. A rotor as in claim 4 wherein an insulating tube inserted in the rotor core separates the coil support from the core.

6. A rotor as in claim 1 wherein the end shafts are a non-magnetic metal.

7. A rotor as in claim 6 wherein the end shafts are stainless steel.

8. A rotor as in claim 1 wherein the rotor core is a solid magnetic iron forging.

9. A rotor as in claim 1 wherein the coil has a race-track shape.

10. A rotor as in claim 1 further comprising a conductive shield around the rotor core and coil.

11. A rotor as in claim 1 wherein one of said end shafts is a collector end shaft having collector rings and a cryogenic fluid coupling.

12. A method for assembling a high temperature super-conducting rotor having a coil winding on a solid iron rotor core of a synchronous machine comprising the steps of:

a. extending a tension bar through a conduit in said rotor core, wherein said conduit extends between opposite planer sections on long sides of the core;

b. inserting a housing over a portion of the coil;

c. attaching an end of the tension bar to the housing, and

d. attaching rotor end shafts to opposite ends of the rotor core.

13. A method as in claim 12 further comprising covering the core with a conductive shield.

14. A method as in claim 12 further comprising coupling a source of cryogenic cooling fluid to a first end shaft having a cryogenic coupling.

15. A method as in claim 12 wherein each end shaft includes a collar having and a collar slot, and further comprising attaching the collar to an end of the core such that an end of the coil fits in the collar slot.

16. A method as in claim 12 wherein steps (a) to (h) are performed sequentially and in order.

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17. In a synchronous machine, a rotor comprising:

a cylindrical rotor core having a pair of planer sections on opposite sides of the core and extending longitudinally along the core;

a super-conducting coil winding extending around at least a portion of the rotor core, said coil winding having a pair of side sections adjacent said planer sections of the core;

a first end shaft extending axially from a first end of the rotor core, and

a second end shaft extending axially from a second end of the rotor core.

18. In a rotor as in claim 17 wherein the first end shaft includes a cryogenic coupling for providing cooling fluid to said coil winding.

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19. In a rotor as in claim 17 further comprising a coil support including at least one tension rod extending through the core and attaching to coil

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~~housings at opposite ends of the rod, wherein each coil housing wraps around one of the side sections of the coil.~~

20. A rotor as in claim 19 wherein the coil support and coil are at cryogenic temperatures, and the coil support is thermally isolated from the rotor core.

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~~21. A rotor as in claim 20 wherein an insulating tube inserted in the rotor core separates the tension rod from the core.~~

22. A rotor as in claim 17 wherein the end shafts are a non-magnetic metal.

23. A rotor as in claim 22 wherein the end shafts are stainless steel.

24. A rotor as in claim 17 wherein the rotor core is a solid magnetic iron forging.

25. A rotor as in claim 17 wherein the coil has a race-track shape.

26. A rotor as in claim 17 further comprising a conductive shield around the rotor core and coil.

27. A rotor as in claim 17 wherein one of said end shafts is a collector end shaft having collector rings and a cryogenic fluid coupling.